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ABSTRACT

Pronunciation of words with a fricative content was elicited over a seven-month period from seven English-speaking children ranging in age from 1;5 to 2;3. The recorded speech was analyzed for correct fricative production and substitutions. Results indicate that: (1) overall percentage of correct production is slightly higher in final position than in other positions; (2) individual subjects did not favor a specific position for all fricatives, nor was one particular fricative consistently favored by all children; (3) although there is considerable variation, substitutions of tighter closure are found in highest concentration in prevocalic position, followed by initial preconsonantal position; (4) there was no clear longitudinal order progression of fricative substitutions; and (5) there is considerable evidence for an order of fricative acquisition that varies somewhat from child to child. (JB)

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# WORD-POSITION IN FRICATIVE ACQUISITION*

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Recently many claims, most of which need further substantiation, have been made about children's acquisition of fricatives. Several of these claims involve word-position, a potentially important variable in phonological acquisition. For example, Ferguson, in a 1975 paper stated that fricatives are easiest to acquire in postvocalic, final position, or intervocalically, and that substitutions of tighter closure are most prevalent in initial position. Farwell in 1977 argued that final position is 'favored' for fricatives. For instance, they are acquired there first. Ingram in 1975 claimed that fricative substitutions occur in a "striking and invariant order" -- deletion > stopping > continuance, with liquids or glides appearing before continuant obstruents. Ingram also postulated five stages in the acquisition of word-initial fricatives. In the first stage they are avoided; in the second they are replaced by stops, in the third by continuants, etc. In addition, Ingram reported a general order of acquisition for initial fricatives: /f/ and /s/ > the affricates and /ʃ/ > the interdentals, /z/ and /v/. Ingram's study was limited to word-initial position because, in his words, "fricatives and affricates show both a different and delayed development there as opposed to word-finally." If production does, in fact vary with word-position, this raises the question of whether Ingram's order (and also his stages) apply in different positions.

The purpose of the study that I am reporting was to investigate some of the claims that have been made and the issues that they raise, and by doing so to clarify the role of word-position in children's acquisition of fricatives; that is, to answer the question: Does word-position affect the acquisition of fricatives, and if so, how? The specific questions that were investigated are:

1. Is final position 'favored' for fricatives, as claimed by Farwell (1977) and others? (For example, are fricatives produced correctly more often in that position?)

2. Are substitutions of tighter closure most prevalent in initial position, as claimed by Ferguson (1975)?

3. Do fricative substitutions appear in the order deletion > stopping > continuance (liquids or glides, then obstruents), as

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claimed by Ingram (1975), and are his five 'stages' applicable in different positions?

4. Does order of acquisition vary with word-position, and if so, how?

## PROCEDURE

### Subjects

The subjects for this study were six monolingual English-learning children, four boys and three girls, who were between the ages of 1;5 and 2;3 when the study began. They were from similar backgrounds and were living in the area of Palo Alto, California. Each child was seen individually between eight and twelve times over a seven-month period.

### Stimulus Items

During each recording session, the child was encouraged to spontaneously name and talk about a set of objects and pictures specifically chosen to elicit the ten "target sounds" in various word-positions. This gave a basic list of vocabulary items like juice and shoes which contain at least one fricative and are likely to be familiar to young children.

All sessions took place in a sound-treated room and were recorded on a high quality reel-to-reel tape recorder, using a microphone concealed in a vest worn by the child. Although another adult and I were present at every session, only one of us interacted with the child.

### Transcription

Shortly after each session, another researcher and I, working independently, narrowly transcribed all child renditions of words containing target sounds in their adult form. We used the standard International Phonetic Alphabet symbols and diacritics, supplemented with special symbols made up at Stanford University for use in transcribing child speech. (See Bush et al., 1973.) These transcriptions comprise the data for the study. There are approximately 3400 target words and 5000 target sounds in all.

### Analysis

In analyzing these data, I disregarded diacritics. Because the transcriptions were extremely narrow, it would not have been possible to make many generalizations if attention had been paid to the fine phonetic detail. Five specific word-positions were considered in this analysis: initial prevocalic, initial preconsonantal, intervocalic, final postvocalic, and final postconsonantal. Although the data contain both spontaneous and imitated forms, the results presented here are based only on spontaneous utterances.

In classifying types of substitutes, I used the five categories listed below. The last three categories were used because Ferguson, in particular, stated that fricatives may be replaced by substitutes of tighter closure (stops or affricates), looser closure (liquids or glides), or acoustically similar fricatives (differing, for example, in place or articulation or stridency).

C - correct (disregarding diacritics)

D - deleted

T - replaced by a substitute of tighter closure (a stop or affricate)

L - replaced by a substitute of looser closure (a liquid or glide)

S - replaced by a similar fricative or affricate (differing, for instance, in stridency)

The results reported here concern only substitutes that have one part. In other words, cases in which a fricative is replaced by two or more sounds are not included. Two-component substitutions such as [sl] for /θ/ or [fw] for /f/ are fairly common in the data and will be analyzed at a later time.

## RESULTS AND DISCUSSION

### Q1. 'Favored' status of final position

The results for question 1 are shown in Tables 1a and 1b. If data are pooled across fricatives and children, the overall percentage of correct production is slightly higher in final positions than in other positions. This is shown at the bottom of Table 1a. The percentage correct is highest for final postconsonantal position (54%) and is second highest for final postvocalic position (43%). However, if individual fricatives are considered, the picture is not as neat. Two fricatives, /f/ and /dʒ/, are most often correct in initial prevocalic position (across subjects). One fricative, /z/, appears to be 'favored' in intervocalic position, judging from the percentage of correct production. Five fricatives are 'favored' in final postvocalic position, and one in final postconsonantal position (/s/). Thus it is clear that final position is not favored 'across the board', although it is favored for several fricatives.

Finally, if the data are separated by subject and target sound, the picture is even more complicated, as shown in Table 1b. (See page 71.) Each position has the highest percentage of correct production for at least one subject and one fricative. So, each position is 'favored' to some extent.

I had thought that one subject might favor one specific position quite consistently for all fricatives. However, as Table 1b illustrates, that was not the case. Rather, each child exhibited some variation. In fact, each subject favored at least three different positions for different fricatives. AE was quite consistent, favoring initial prevocalic position for four fricatives and preconsonantal position for two. He was the only subject who favored more fricatives in initial prevocalic position (4) than in postvocalic positions (2). For most subjects, postvocalic positions were favored for several target sounds. However, LB was the only child who did not favor initial prevocalic position for any fricatives. Table 1b shows plainly that one child does not favor one position for all fricatives, although tendencies can be discerned for some children.

Table 1b also shows that one particular fricative is not consistently favored in one position by all children. The most noteworthy results can be summarized as follows: (1) Four children favored /dʒ/ in initial position. (2) Four children also favored /f/ in initial positions, if both

Table 1a

Percentage of correct production in each position, across subjects*

| Sound | #_V | #_C | V_V | V_# | C_# | Tokens |
|---|---|---|---|---|---|---|
| /f/ | 54 | 46 | 49 | 51 | --- | 416 |
| /dʒ/ | 21 | --- | 0 | 0 | 0 | 144 |
| /z/ | 39 | --- | 74 | 40 | 34 | 298 |
| /ð/ | 5 | --- | 36 | +100 | --- | 122 |
| /v/ | 50 | --- | 35 | 60 | --- | 102 |
| /ʃ/ | 16 | --- | 21 | 28 | --- | 187 |
| /tʃ/ | 10 | --- | 10 | 24 | --- | 86 |
| /θ/ | 7 | 9 | 0 | 15 | --- | 112 |
| /s/ | 67 | 39 | 61 | 63 | 76 | 472 |
| Across Sounds | 33 | 38 | 41 | 43 | 54 | 1939 |

*Based on the total number of times each sound was attempted in spontaneous utterances, excluding identical repetitions.

+Based on only one example.

Table 1b

Position 'favored' by each subject for each scund*

| Subject | #_V | #_C | V_V | V_# | C_# |
|---|---|---|---|---|---|
| AE | f,v,tʃ,dʒ | θ,s | z | ð | --- |
| SH | f,s,dʒ | --- | ʃ,ð,z | θ,v,tʃ | --- |
| JH | ð,dʒ | --- | v,z | f | s |
| LB | --- | f | ʃ,v,z | s,tʃ | --- |
| CH | dʒ | --- | ð,z | f,v | s |
| KJ | s | f | tʃ | ʃ | --- |

*Determined for each subject and each sound by comparing percentages of correct production across positions.

prevocalic and preconsonantal positions are combined. (3) Five children favored /z/ in intervocalic position. (4) Four children favored /v/ in postvocalic positions (including both intervocalic and final postvocalic). (5) Similarly, three children favored /ð/, three favored /ʃ/, and three favored /tʃ/ in postvocalic positions. Results for /θ/ and /s/ were mixed.

Q2. Tighter closure

The results for question 2 are shown in Tables 2a and 2b. As the last row of Table 2a shows, the highest overall percentage of substitutions of tighter closure is found in initial prevocalic position (55%), followed by initial preconsonantal position (48%). However, if individual fricatives are considered, there is some variation. Substitutions of tighter closure are more prevalent in initial prevocalic position for five fricatives and in initial preconsonantal position for one (/f/). These are shown above the dotted line in Table 2a. Substitutions of tighter closure are not most common in final position for any fricative, but they are most prevalent in intervocalic position for three sounds, those below the dotted line (/v/, /z/, /θ/). Thus it is evident that substitutions of tighter closure are not most prevalent in initial position for all fricatives, even though the overall percentage is somewhat higher there.

If the data are examined separately for each subject and each sound, there is even more variation, as shown in Table 2b. (See page 73.) Each

Table 2a

Percentage of substitutions that involves tighter closure in each position, across subjects*

| Sound | #_V | #_C | V_V | V_# | C_# | Tokens |
|---|---|---|---|---|---|---|
| /ð/ | 93 | --- | 64 | --- | --- | 102 |
| /dʒ/ | 59 | --- | 29 | 19 | 8 | 116 |
| /s/ | 58 | 48 | 17 | 29 | 20 | 120 |
| /tʃ/ | 40 | --- | 0 | 10 | --- | 76 |
| /ʃ/ | 21 | --- | 5 | 14 | --- | 146 |
| /f/ | 62 | 71 | 47 | 43 | --- | 141 |
| /v/ | 50 | --- | 77 | 40 | --- | 51 |
| /z/ | 50 | --- | 60 | 8 | 9 | 160 |
| /θ/ | 23 | 14 | 38 | 3 | --- | 102 |
| Across Sounds | 55 | 48 | 41 | 16 | 11 | 1014 |

*Based on the total number of substitutes found for each sound in each position in spontaneous utterances, excluding identical repetitions.

Table 2b

Sounds for which substitutions of tighter closure are most prevalent in each position for each subject*

| Subject | #_V | #_C | V_V | V_# | C_# |
|---|---|---|---|---|---|
| KJ | ʃ, f, ð, z, dʒ | --- | --- | --- | --- |
| CH | θ, tʃ, ð, z, dʒ | --- | v | ʃ | --- |
| AE | tʃ, v, s, dʒ | f | ð, ʃ | --- | z |
| SH | θ, ð, s, dʒ | f | v | z | --- |
| LB | ð, ʃ, tʃ | s | θ, dʒ | z | --- |
| JH | θ, tʃ | --- | f, ð, z | ʃ, v, dʒ | --- |

*Determined for each subject and each sound by comparing the percentage of substitutions that involves tighter closure across positions. Cases in which percentages are equal in two positions are excluded.

subject has a higher percentage of substitutions of tighter closure in initial prevocalic position for at least two fricatives, but all subjects except KJ also have a higher percentage in other positions for at least two sounds. However, JH is the only subject for whom substitutions of tighter closure predominate in postvocalic positions rather than initial positions.

Results for the various target sounds are summarized as follows: (1) For the affricates and /ð/, substitutions of tighter closure are most prevalent in initial prevocalic position for four subjects. (2) If initial prevocalic and preconsonantal positions are combined, three subjects have a higher percentage for initial /θ/, /f/, and /s/ than for these sounds in noninitial positions. (3) Three subjects have a higher percentage of substitutions of tighter closure in postvocalic positions for three fricatives (/v/, /ʃ/, /z/), but if final postvocalic and postconsonantal positions are combined, three subjects have a higher percentage for /z/ in final positions. If is clear, then that although the general tendency is for substitutions of tighter closure to be more common in word-initial position than in other postions, this does vary with individual fricatives and individual children.

Q3. Order of fricative substitutions and stages

At this point I have some results concerning question 3 for two subjects, KJ, the youngest and a boy, and LB, the oldest and a girl. These results offer almost no support for Ingram's order of fricative substitutions, even when each position is considered separately. When the data for fricatives as a group were compared across sessions, there was no clear progression of substitution types. Rather, the different types of substitutes co-occurred throughout the period. When each fricative was considered by itself, I again found that different types of substitutes usually co-occurred, and moreover, particular types and orders of substitutes were often associated with particular lexical items for a given child, or at least with specific phonetic contexts. For example, LB had several different substitutes for initial /dʒ/, as shown below. She usually replaced /dʒ/ by [b] in jack-in-the-box, presumably by assimilation. In giraffe she deleted it or replaced it by a glide [j] or a stop [$t^h$]. In jelly a palatal glide was the substitute. Initial /dʒ/ was replaced by [d] in jacks and jacket, by [d] or [$d^j$] in juice, and by [$d^j$] in jet. In the word Jeanie initial /dʒ/ was produced correctly. So, substitutions of tighter closure varied with substitutions of looser closure, as well as deletion and correct production. The substitution types did not change over time, in the manner predicted by Ingram. Instead, they varied according to lexical item.

LB's substitutes for initial /dʒ/

| | | |
|---|---|---|
| $d^j$ | jet | (session 1) |
| b | jack-in-the-box | (sessions 1,2) |
| ø | giraffe | (sessions 1,2,3) |
| j | | (session 5) |
| $t^h$ | | (session 7) |
| d | jacks | (session 3) |
| d ~ ($d^j$) | juice | (sessions 2,7,8,10) |
| | jacket | (session 5) |
| dʒ | Jeanie | (session 4) |
| j | jelly | (session 6) |

The small amount of support that can be found for Ingram's order of fricative substitutions appears only when individual words are followed over time. For instance, in the word vest LB first had a stop substitute [b] for /v/ and later a continuant substitute [w]. So she had stopping before continuance, as Ingram predicts, but counterevidence to Ingram's order also appears when individual words are considered. For example, LB first deleted the initial /dʒ/ in giraffe and then replaced it by a glide, and finally by a stop. In other words, she had continuance before stopping, while Ingram predicts the opposite order.

These data provide no definitive evidence concerning the applicability of Ingram's 'stages' in different word-positions because the subjects changed very little in their fricative production during the seven-month recording period. For each subject I compared the percentages of the various types of substitutes at three sessions, the first session, the last session, and one in the middle of the data collection period, and I found that different types

of substitutes co-occurred at nearly every session. Sometimes substitutions of tighter closure predominated, and sometimes continuant substitutes were more prevalent, but there was no clear progression from predominance of stop substitutes (which would be typical of Stage 2) to predominance of continuant substitutes (Stage 3).

What my data do show is that the 'stage' a child appears to be at depends on which word-position is considered. At many sessions substitutions of tighter closure predominate in initial position, while continuant substitutes predominate in final position. Thus the subject would be at Stage 2 if only initial position were considered, but at Stage 3 if only final position were considered. To illustrate, at session 7 all of KJ's substitutes for initial fricatives involved tighter closure, while all of his word-final substitutes involved continuants. Table 3 shows the percentage of substitutes that involves tighter closure and the percentage that involves similar fricatives for KJ and LB in three word positions (across sessions and fricatives).

Table 3

Percentage of substitutions that involves tighter closure (stopping) and similar fricatives (continuance) in three word-positions for KJ and LB, across sounds*

| | | #_V | V_V | V_# |
|---|---|---|---|---|
| KJ | T | 64 | 33 | 8 |
| | S | 24 | 33 | 76 |
| LB | T | 60 | 53 | 12 |
| | S | 12 | 21 | 60 |

*Based on the total number of substitutions found for each sound in each position in spontaneous utterances, excluding identical repetitions.

Overall, stop substitutes predominate in initial position, and continuant substitutes predominate in final position. Results for intervocalic position are mixed. The situation is basically the same for individual fricatives. In only a few cases does one type of substitution predominate in both initial and final positions for a child. Therefore, these data indicate that 'stage' of acquisition is only statable when qualified by information about word-position.

Q4. Order of acquisition

Finally, I have some preliminary results from KJ and LB that bear on question 4. Below there is an order of acquisition for each of these subjects based on 75% correct production in spontaneous utterances:

KJ: I /ʃ/ > {Pre./f/, F /ʃ,s/} > F /f/ > {Int./tʃ/, I /s/}

LB: Pre./f/ > {Pre./s/, Int./s/, Int./f/} > F /f/ > {F /ʃ/, Post./s/} > {F /s/, Int./v/} > F /z/

As shown above, not all fricatives were acquired first in the same position, and in addition, the precise order of acquisition for each child varied somewhat in the different positions. For example, for KJ /ʃ/ was the first fricative acquired in initial prevocalic position, but /f/ was acquired first in preconsonantal position, and in intervocalic position the affricate /tʃ/ was the first fricative to reach 75% correct production.

## CONCLUSION

Several conclusions can be drawn from this study. First, the situation with fricative acquisition is very complicated, and there is much more unexplained variation than previous researchers have suggested. Second, it is nevertheless true that word-position is an important variable in child phonology, at least for fricatives, and finally, information about word-position must therefore be taken into account in any statement of substitution types or order and stages of fricative acquisition.

## REFERENCES

Bush, C.N., Edwards, M.L., Luckau, J.M., Stoel, C.M., Macken, M.A., and Petersen, J.D. (1973). On specifying a system for transcribing consonants in child language: a working paper with examples from American English and Mexican Spanish. Unpublished manuscript, Committee on Linguistics, Stanford University, Stanford, CA.

Farwell, C.B. (1977). Some strategies in the early production of fricatives. Papers and Reports on Child Language Development 12:97-104.

Ferguson, C.A. (1975). Fricatives in child language acquisition. Proceedings of the Eleventh International Congress of Linguists. Bologna-Florence, 647-64. (Earlier version in PRCLD 6:1-60, 1973.)

Ingram, D.I. (1975). The acquisition of fricatives and affricates in normal and linguistically deviant children. In A. Caramazza and E. Zurif (eds.), The Acquisition and Breakdown of Language. Baltimore: Johns Hopkins University Press.